



**NTSB** National Transportation Safety Board

**Improved  
Productivity and Safety  
Through Better  
Collaboration and  
Prioritization:  
*Lessons Learned in  
Aviation***

Presentation to:

Riverside EMS Agency

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# The Contrast

## - Conventional Wisdom:

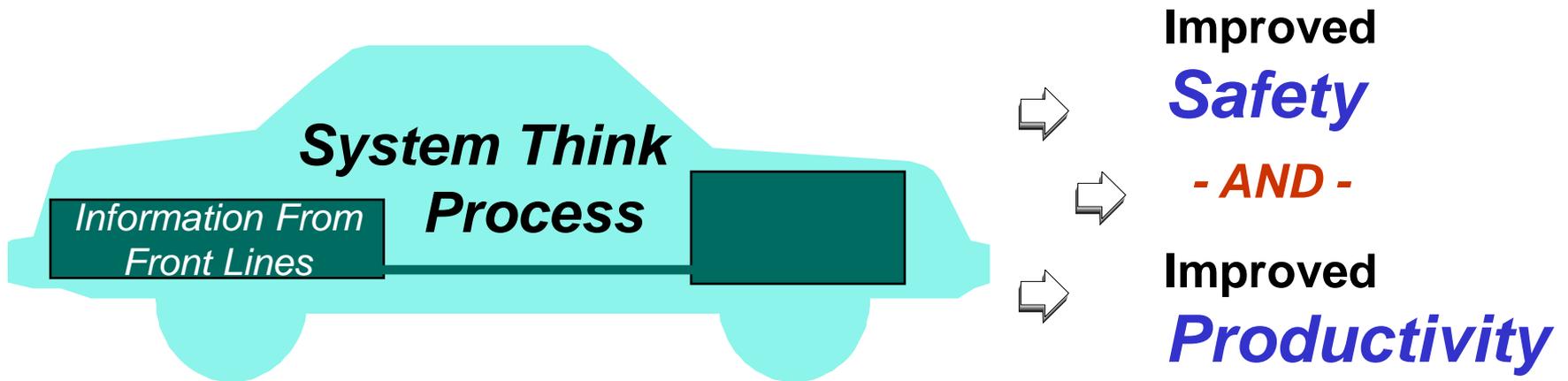
Improvements that reduce risk  
*also usually reduce productivity*

## - Lesson Learned from Proactive Aviation Safety Programs:

Risk can be reduced in a collaborative way that also  
results in *immediate productivity improvements*



# Process Plus Fuel Creates A Win-Win



# Outline

- **The Context**
- **Importance of “System Think”**
- **Importance of Better Information**
- **Safety and Productivity Benefits**
- **Roles of Leadership and Regulator**
- **Prioritization Challenges**



# NTSB 101

- Independent federal agency, investigate transportation mishaps, all modes
- Determine probable cause(s) and make recommendations to prevent recurrences
- Primary product: Safety recommendations
  - Favorable response > 80%
- ***SINGLE FOCUS IS SAFETY***
- Independence
  - Political: Findings and recommendations based upon evidence rather than politics
  - Functional: No “dog in the fight”



# The Context: Increasing Complexity

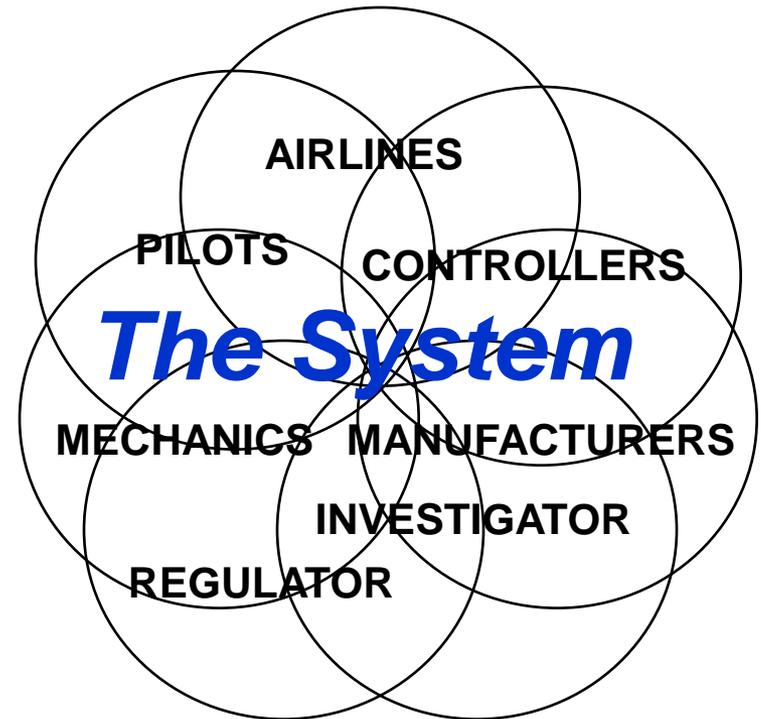
- **More System**

  - *Interdependencies*

    - Large, complex, interactive system
    - Often tightly coupled
    - Hi-tech components
    - Continuous innovation
    - Ongoing evolution

- **Safety Issues Are More Likely to Involve**

  - *Interactions Between Parts of the System*



# Effects of Increasing Complexity:

## **More** “Human Error” Because

- **System More Likely to be Error Prone**
- **Operators More Likely to Encounter Unanticipated Situations**
- **Operators More Likely to Encounter Situations in Which “By the Book” May Not Be Optimal (“workarounds”)**



# The Result:

## Front-Line Staff Who Are

- Highly Trained
- Competent
- Experienced,
- Trying to Do the Right Thing, and
- Proud of Doing It Well

... Yet They Still Commit

**Inadvertent  
Human Errors**



# **The Solution: System Think**

***Understanding how a change in one subsystem of a complex system may affect other subsystems within that system***



# “System Think” via Collaboration

**Bringing all parts of a complex system together to collaboratively**

- **Identify potential issues**
- ***PRIORITIZE* the issues**
- **Develop solutions for the prioritized issues**
- **Evaluate whether the solutions are**
  - **Accomplishing the desired result, and**
  - **Not creating unintended consequences**



# When Things Go Wrong

## How It Is Now . . .

You are highly trained

*and*

If you did as trained, you  
would not make mistakes

so

You weren't careful  
enough

so

You should be **PUNISHED!**

## How It Should Be . . .

You are human

*and*

Humans make mistakes

so

Let's *also* explore why the  
system allowed, or failed to  
accommodate, your mistake

*and*

Let's **IMPROVE THE SYSTEM!**



# Fix the Person or the System?

Is the **Person**  
*Clumsy?*

Or Is the  
Problem . . .

The *Step???*



# Enhance Understanding of Person/System Interactions By:

- Collecting,
  - Analyzing, and
  - Sharing
- ## Information



# Objectives:

**Make the System**

***(a) Less  
Error Prone***

**and**

***(b) More  
Error Tolerant***



# The Health Care Industry

## *To Err Is Human:*

### *Building a Safer Health System*

**“The focus must shift from blaming individuals for past errors to a focus on preventing future errors by designing safety into the system.”**

**Institute of Medicine, Committee on Quality of Health Care in America, 1999**



# **Major Source of Information: Hands-On “Front-Line” Employees**

**“We Knew About  
That Problem”**

***(and we knew it might hurt  
someone sooner or later)***



# Next Challenge



**Legal/Cultural Issues**

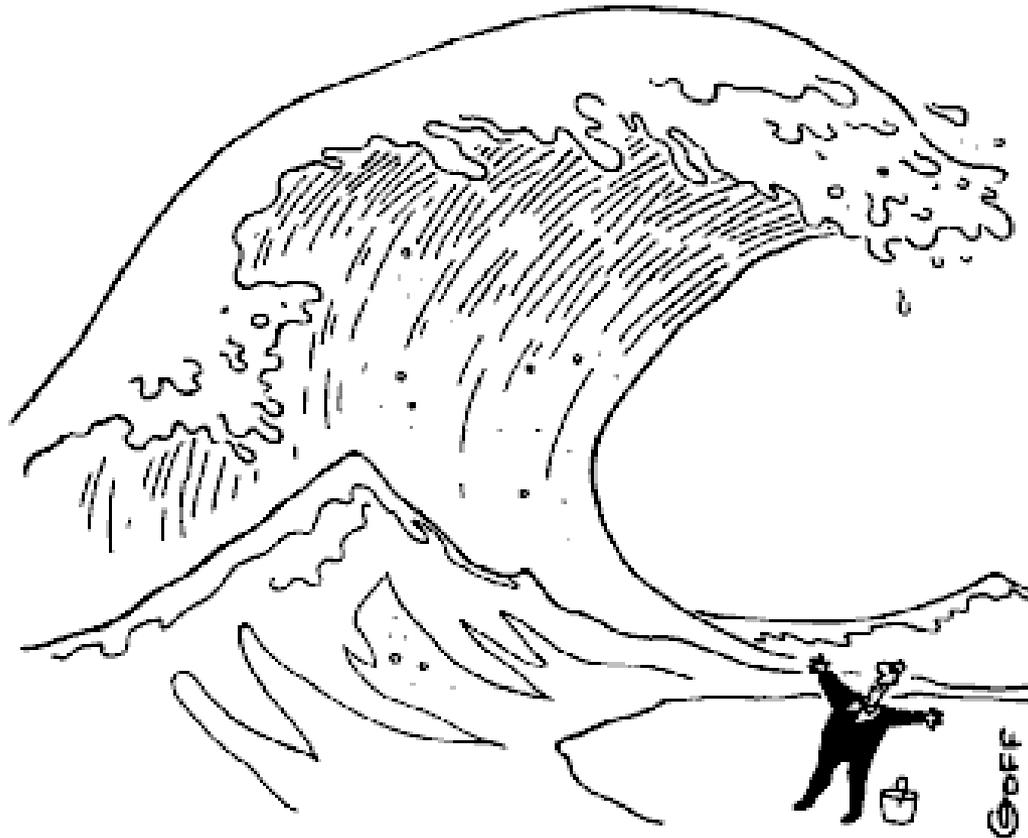
**Improved Analytical Tools**

*As we begin to get over the first hurdle, we must start working on the next one . . .*



# Information Overload

© 1996 Ted Goff



"EUREKA! MORE INFORMATION!"

# From Data to Information

*Tools and processes to convert large quantities of data into useful information*

## Data Sources

Info from front line staff and other sources

**DATA**



**Analysts**

**USEFUL**

**INFORMATION**

## Smart Decisions

- Identify issues
- **PRIORITIZE!!!**
- Develop solutions
- Evaluate interventions

**Tools**

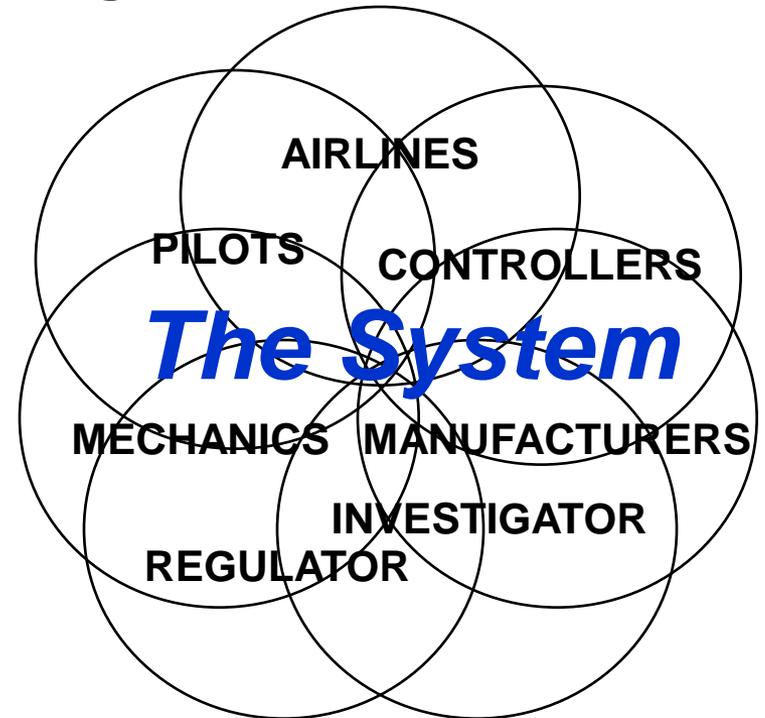


**Processes**



# Aviation “System Think” Process

- Engage All Participants In Identifying Problems and Developing and Evaluating Remedies
- Airlines
- Manufacturers
  - *With the systemwide effort*
  - *With their own end users*
- Air Traffic Organizations
- Labor
  - *Pilots*
  - *Mechanics*
  - *Air traffic controllers*
- Regulator(s) [Query: Investigator(s)?]



# Success Story

**65% Decrease** in Fatal Accident Rate,  
1997 - 2007

largely because of  
***System Think***

fueled by  
***Proactive Safety  
Information Programs***

P.S. Aviation was already considered **VERY SAFE** in 1997!!



# Moral of the Story

Anyone who is  
involved in the *problem*  
should be involved in  
developing the *solution*



# Collaboration: A Major Paradigm Shift

- **Old: Regulator identifies a problem and proposes solutions**
  - Industry skeptical of regulator’s understanding of the problem
  - Industry resists regulator’s solutions and/or implements them begrudgingly
  
- **New: Collaborative “System Think”**
  - Industry involved in identifying problem
  - Industry “buy-in” re interventions because everyone had input, everyone’s interests considered
  - Prompt and willing implementation
  - Interventions evaluated . . . *and tweaked as needed*
  - Solutions probably more effective and efficient
  - Unintended consequences much less likely



# Challenges of Collaboration

- Human nature: “I’m doing great . . . *the problem is everyone else*”
- Differing and sometimes competing interests
  - Labor-management issues
  - May be potential co-defendants
- Regulator probably not welcome
- Not a democracy
  - Regulator must regulate
- Requires all to be willing, in their *enlightened self-interest*, to leave their “comfort zone” and think of the System



# System Think at Other Levels

- **“System Think” can be successful at any macro/micro level, including**
  - Entire industry
  - Company (some or all)
  - Type of activity
  - Facility
  - Team
- **Persistent workplace problem?**



# Manufacturer Level “System Think”

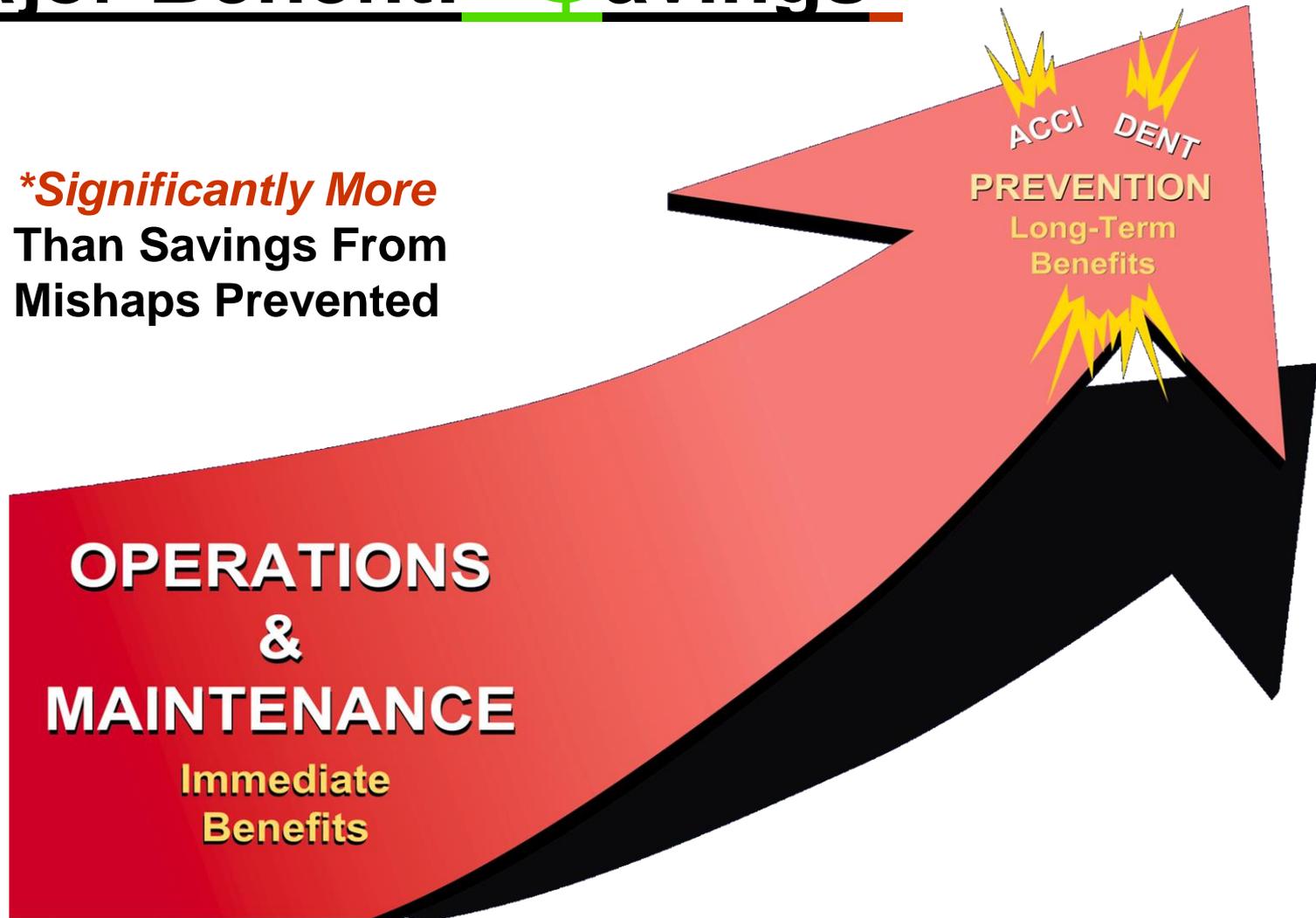
Aircraft manufacturers are increasingly seeking input, from the earliest phases of the design process, from

- *Pilots* (*User* Friendly)
- *Mechanics* (*Maintenance* Friendly)
- *Air Traffic Services* (*System* Friendly)



# Major Benefit: Savings\*

*\*Significantly More*  
Than Savings From  
Mishaps Prevented



# Safety/Productivity Success Stories

- **Ground Proximity Warning System**
  - **S:** *Reduced warning system complacency*
  - **P:** *Reduced unnecessary missed approaches, saved workload, time, and fuel*
  
- **Flap Overspeed**
  - **S:** *No more potentially compromised airplanes*
  - **P:** *Significantly reduced need to take airplanes off line for **VERY EXPENSIVE (!!) disassembly, inspection, repair, and reassembly***



**But Then . . .**

**Why Are We**

**So Jaded in The Belief That**

***Improving Safety***

***Will Probably***

***Hurt The Bottom Line??***



# Costly Result\$ Of Safety Improvements Poorly Done

## Safety *Poorly* Done

### 1. Punish/re-train operator

- *Poor workforce morale*
- *Poor labor-management relations*
- *Labor reluctant to tell management what's wrong*
- *Retraining/learning curve of new employee if "perpetrator" moved/fired*
- *Adverse impacts of equipment design ignored, problem may recur because manufacturers are not involved in improvement process*
- *Adverse impacts of procedures ignored, problem may recur because procedure originators (management and/or regulator) are not involved in improvement process*

## Safety *Well* Done

Look beyond operator,  
also consider system  
issues



# Costly Result\$ Of Safety Poorly Done (con't)

## Safety *Poorly* Done

### 2. Management decides remedies unilaterally

- *Problem may not be fixed*
- *Remedy may not be most effective, may generate other problems*
- *Remedy may not be most cost effective, may reduce productivity*
- *Reluctance to develop/implement remedies due to past remedy failures*
- *Remedies less likely to address multiple problems*

### 3. Remedies based upon instinct, gut feeling

- *Same costly results as No. 2, above*

## Safety *Well* Done

Apply “System Think,” *with workers*, to identify and solve problems

Remedies based upon evidence (including info from front-line workers)

# Costly Result\$

## Of Safety Poorly Done (con't)

### Safety *Poorly* Done

4. Implementation is last step

- *No measure of how well remedy worked (until next mishap)*
- *No measure of unintended consequences (until something else goes wrong)*

### Safety *Well* Done

Evaluation after implementation

### Query: Is Safety Good Business?

- *Safety implemented poorly can be **very costly (and ineffective)***
- *Safety implemented well, in addition to improving safety more effectively, can also **create benefits greater than the costs***



# The Role of Leadership

- Demonstrate Safety Commitment . . .

***But Acknowledge That Mistakes Will Happen***

- Include “Us” (e.g., System) Issues,  
Not Just “You” (e.g., Training) Issues

- **Make Safety a Middle Management Metric**

- Engage Labor Early

- Include the **System** --

**Manufacturers, Operators, Regulator(s), and Others**

- Encourage and Facilitate Reporting

- Provide **Feedback**

- Provide Adequate **Resources**

- **Follow Through** With Action



# How The Regulator Can Help

- Emphasize the importance of System issues *in addition to (not instead of)* worker issues
- Encourage and participate in industry-wide “System Think”
- Facilitate collection and analysis of information
  - Clarify and announce *policies for protecting information and those who provide it*
  - Encourage other industry participants to do the same
- Recognize that *compliance* is very important, but the *mission is reducing systemic risk*

# Next Challenge: Prioritization

You will probably identify *more potential concerns* than you have resources to address

Cost to address potential concern 1  
+ Cost to address potential concern 2  
+ Cost to address potential concern 3  
+ . . .  
+ . . .  
+ . . .  
+ Cost to address potential concern “n”  
*Total: More than available resources*

So . . . how to decide, *BEFORE* a mishap (i.e., *WITHOUT the benefit of 20-20 hindsight*), what to fix first?



# Factors to Consider

- **Severity and likelihood – past, present, and future**
- **Cost of remedy**
- **Synergies of concern with other concerns?**
- **Synergies of remedy with other concerns/remedies?**
- **Other?**
  
- **Process question: First in, first out?**



# Examples of Prioritization Failures?

How many *other pressing issues* (if any) were being addressed when:

- **NASA** responded inadequately to previous events of separated foam that struck the orbiter during launch
- **Concorde** manufacturer and operators responded inadequately to previous tire disintegrations during takeoff
- **Ford and Firestone** responded inadequately to previous tire failures and rollovers in Ford Explorers
- The **intelligence community** responded inadequately to reports about people who wanted to learn to fly – but not how to land – in an airline flight simulator

*Missing Element – The Harsh Glare of Hindsight*



# Is Prioritization Working?

- **Process can never be perfect**
  - Depends heavily upon predictions and judgment calls
  - Particularly difficult in high-tech or otherwise continually changing operations
- **Success may be difficult to measure**
  - Prioritization process may help prevent the **worst** or **most frequent** adverse events, but not necessarily **every** adverse event
  - Thus, when adverse events keep happening, how to determine if the process is working?



# So . . . Collaboration for EMS?

- **Select troublesome area**
  - Nagging problem for many years
  - Many interventions have been tried, not successful
  - Likelihood that problems are systemic, not just people
  - Effort to address the system problems
  - Less defensiveness because not focused on single event
- **Select collaborative corrective action group**
  - All who have a hand in the process
  - Manufacturers?
  - Regulators?
  - Patients?



Thank You!!!



*Questions?*

